REMARKS

Claims 1-13 and 16-36 are pending in this application. Claims 1-13 and 16-36 are rejected under 35 U.S.C. § 103(a) for obviousness over Lee et al. (U.S. Patent No. 6,117,456; hereinafter "Lee et al."). Claims 1-13, 16-25, 27-28, and 30-36 are rejected for obviousness-type double patenting over claims 14, 15, and 22 of U.S. Patent No. 6,287,341 in view of U.S. Patent No. 6,201,039. By this reply, Applicants amend claims 1, 16, 25, 28, 31, and 32, add new claims 37-42, and address each of the Examiner's rejections below.

Support for the Amendment

Support for the amendment to claims 1, 16, 25, 28, 31, and 32, and for new claims 37-42, is found in the specification at, e.g., page 4, lines 7-10, page 7, line 17, through page 8, line 10, and page 11, lines 11-16. No new matter is added by the amendment.

Change in Correspondence Address

Applicants note that the Office action was mailed to the incorrect address. Effective immediately, please address all communication in this application to Paul T. Clark, Clark & Elbing LLP, 101 Federal Street, Boston, MA 02110.

Supplemental IDS

Applicants submit the reference listed on the supplemental IDS and PTO 1449 form and respectfully request that it be considered and made of record.

Rejections under 35 U.S.C. § 103(a)

Claims 1-13 and 16-36 are rejected under 35 U.S.C. § 103(a) for obviousness over Lee et al. The Examiner argues that Lee et al. discloses an implant material in which a first and a second calcium phosphate are combined to form a precursor having a calcium to phosphate ratio in the range of 1.1-1.9 and that may further include a supplementary material to improve the hardness or compressive strength of the poorly crystalline hydroxyapatite (Office Action, p. 2). The Examiner, citing *In re Aller* (105 USPQ 233), states that although Lee et al. does not disclose an implant having a calcium to phosphorous ratio between 1.2 and 1.68 or a compressive strength of 60 MPa or 120 MPa, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide an implant composition having an atomic ratio of calcium to phosphorus between 1.2 and 1.68 or to have adjusted the hardness or compressive strength of the poorly crystalline hydroxyapatite, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (Office Action, pp. 2-3). Applicants respectfully disagree.

The present invention features a bone implant having a compressive strength of at least about 60 MPa and that comprises an unhydrated calcium phosphate precursor. The bone implant converts to a poorly crystalline hydroxyapatite *in vivo* upon hydration at the implantation site. Applicants note that the at least about 60 MPa compressive strength is a characteristic of the bone implant before its conversion to a poorly crystalline hydroxyapatite upon hydration.

In order to establish a *prima facie* case of obviousness, the Patent Office bears the burden of demonstrating that (1) there is some suggestion or motivation in the prior art to modify or

combine the prior art teachings to obtain the claimed invention, (2) the prior art indicates that there is a reasonable expectation of success, and (3) the prior art reference teaches or suggests all of the claim limitations. *See* M.P.E.P. § 2142. Since, as is explained below, the cited art does not satisfy all of these criteria, Applicants respectfully submit that a *prima facie* case of obviousness has not been established.

The Cited Reference Does Not Teach or Suggest All of the Claim Limitations

Each of the independent claims of the present application (i.e., claims 1, 16, 25, 28, 31, and 32) recite a bone implant having a compressive strength of at least about 60 MPa. As was explained in Applicants' previous reply, Lee et al. does not teach or suggest this claim limitation. To further clarify the distinction between Applicants' claimed bone implant and the cement composition of Lee et al., Applicants have amended claims 1, 16, 25, 28, 31, and 32 to recite that the bone implant comprises an unhydrated calcium phosphate precursor. Lee et al. clearly does not teach or suggest this limitation. On the contrary, Lee et al. discloses a cement composition that is formed by combining a calcium phosphate precursor, which has been mixed by hand for 3 to 5 minutes or by machine for 1.5, 2, 5, or 10 minutes, with a physiologically acceptable liquid, such as water. The paste or putty that results is subsequently implanted and forms a hardened poorly crystalline hydroxyapatite *in vivo*, or is allowed to harden *ex vivo* and is then shaped and/or implanted (see, e.g., abstract and col. 8, lines 17-20). The Lee et al. cement composition, which is formed by hydrating the calcium phosphate precursor to form a hardened poorly crystalline hydroxyapatite, clearly differs from the presently claimed bone implant, which comprises an unhydrated calcium phosphate precursor, and Lee et al. does not teach or suggest

preparing the cement composition in the absence of a hydration step. Therefore, this limitation of present claims 1, 16, 25, 28, 31, and 32 is not disclosed by Lee et al. Moreover, nothing in Lee et al. teaches or suggests preparing the cement composition without hydrating the calcium phosphate precursor or that the calcium phosphate precursor should be administered *in vivo* in an unhydrated form prior to its conversion to a poorly crystalline hydroxyapatite.

Lee et al. also does not teach or suggest the preparation of a cement composition having a compressive strength of at least about 60 MPa. As is shown in Example 13 of Lee et al., the cement composition prepared according to the Lee et al. method yields a hardened poorly crystalline hydroxyapatite (i.e., a composition in which the calcium phosphate precursor has already converted to poorly crystalline hydroxyapatite following hydration) having a compressive strength of about 7-9 MPa (see col. 30, lines 45-57), which is much less than the at least about 60 MPa compressive strength of the bone implant of present claims 1, 16, 25, 28, 31, and 32. In fact, the compressive strength of the Lee et al. cement composition is nearly 10 times less than the compressive strength of the presently claimed bone implant. Because Lee et al. does not teach or suggest that the cement composition, either before or after hydration of the calcium phosphate precursor, has a compressive strength of at least about 60 MPa, nor any method that would increase the compressive strength of the cement composition, Lee et al. also fails to teach or suggest this limitation of present claims 1, 16, 25, 28, 31, and 32, and claims dependent therefrom. For these reasons, the Patent Office has failed to establish a *prima facie* case of obviousness.

The Claimed Invention is not an Optimization of Ranges

The Examiner, citing *In re Aller*, argues that it would have been obvious to the skilled artisan, using the disclosure of Lee et al., to adjust the hardness or compressive strength of the Lee et al. cement composition to obtain a bone implant having a compressive strength of 60 or 120 MPa because "where the general conditions of a claim are disclosed in the prior art, discovering the workable or optimum ranges involves only routine skill in the art" (Office Action, pp. 3). *In re Aller* is clearly distinguished from the present facts.

Both the *Aller* method and the prior art Hock and Lang method to which it was compared were directed to the production of the same composition, phenol, and differed only with respect to the sulphuric acid concentration used (25 to 70% vs. 10%) and the reaction temperature (40 to 80°C vs. 100°C). The question put to the *Aller* court was whether the modifications that the *Aller* Inventors made to the Hock and Lang method would have been obvious to one skilled in the art.

The *Aller* Inventors argued that the modifications to the prior art Hock and Lang method resulted in a greater yield of phenol and acetone and a decreased reaction time. The *Aller* court, finding no substantial difference between the *Aller* method and the Hock and Lang method, stated:

> In analyzing these improved results, one is not struck by any difference in kind attributable to appellants' process - logically the improvements could flow equally well from changes in degree resulting from routine variation in temperature or acid concentration. At the least efficient conditions reported by appellants, the improvement is but a few percentage points different from the results reported by the reference. At the most efficient conditions, the improvement is still within the range of variation one might expect to result from changes in reaction conditions. There is no temperature range or acid concentration range that can really be termed "critical."...Appellants have not shown anything "critical" about their process, unless lower temperatures and higher acidity generally are critical. (*Id* at 457.)

Thus, *In re Aller* involved a situation in which both the *Aller* method and the prior art Hock and Lang method produced the same product with seemingly little or no improvement in the product or the method used to make the product. The *Aller* test, therefore, is whether a claimed process or composition is different in kind and not merely in degree and whether the criticality of the claimed ranges has been shown.

In the present case, the Lee et al. cement composition is distinctly different from the presently claimed bone implant, as is discussed above. First, the calcium phosphate precursor of the presently claimed bone implant is unhydrated (claims 1 and 16), and the bone implant is administered in this unhydrated form (claims 25, 28, 31, and 32). In contrast, the Lee et al. cement composition is produced by hydrating the calcium phosphate precursor prior to implantation to form a paste or putty, which hardens to form a poorly crystalline hydroxyapatite *in vivo*, following implantation, or *ex vivo*. Second, the presently claimed bone implant exhibits a compressive strength of at least about 60 MPa, while the Lee et al. cement composition exhibits a compressive strength of only 7-9 MPa. Clearly, the bone implant of present claims 1, 16, 25, 28, 31, and 32, and claims dependent therefrom, is nearly ten times stronger than the Lee et al. cement composition. Therefore, based on the differences discussed above, Applicants argue that the presently claimed bone implant is not merely different in degree from the Lee et al. composition, but is truly different in kind. Furthermore, the compressive strength characteristic is a critical difference that distinguishes the presently claimed bone implant from the Lee et al. cement composition. For these reasons, the bone implant of present claims 1, 16, 25, 28, 31, and 32 clearly satisfies the *Aller* test for obviousness.

The Examiner argues that the skilled artisan would have adjusted the hardness or

compressive strength of the Lee et al. cement composition to obtain the presently claimed bone implant having a compressive strength of at least about 60 MPa because this is merely an optimization and that "[m]ere arguments by counsel cannot take the place of evidence" (Office Action, pp. 3 and 6). As evidence that the presently claimed bone implant is not merely an optimization of the Lee et al. method, Applicants direct the Examiner to the Second Declaration of Aliassghar N. Tofighi, submitted herewith, which states that one skilled in the art could not obtain a bone implant having a compressive strength of at least about 60 MPa by following the guidance of Lee et al. (see paragraph 4 of the Second Tofighi Declaration). Dr. Tofighi, an expert in his field and a named inventor of Lee et al., states that mixing the calcium phosphate starting materials by hand for 3 to 5 minutes (by using a mortar and pestle) or by machine mixing for 1.5, 2, 5, or 10 minutes, as is disclosed in Lee et al. (see, e.g., Examples 1, 2, 8-12, 19, and 21), will not yield a bone implant having a compressive strength of at least about 60 MPa, as is recited in present claims 1, 16, 25, 28, 31, and 32. In fact, grinding the calcium phosphate starting material for 10 minutes (the maximum time disclosed by Lee et al.), according to the method disclosed by Lee et al., produces a calcium phosphate precursor which, when hydrated, hardens to form a poorly crystalline hydroxyapatite having a compressive strength of only 10 MPa (see paragraph 5 of the Second Tofighi Declaration). Furthermore, Dr. Tofighi confirms that even if one skilled in the art were to "optimize" Lee et al. by extending the mixing time beyond 10 minutes, the resulting cement composition would still lack the at least about 60 MPa compressive strength of the bone implant of present claims 1, 16, 25, 28, 31, and 32. Dr Tofighi states that increasing the SPEX grinding process disclosed by Lee et al. to 30 minutes results in a cement composition having a maximum compressive strength of about 20-25 MPa (see

paragraph 7 of the Second Tofighi Declaration). Furthermore, increasing the grinding time beyond 30 minutes results in heat-producing friction that changes the chemistry of the raw materials, which precludes formation of a poorly crystalline hydroxyapatite. Therefore, based solely on the methods disclosed by Lee et al., the skilled artisan could not prepare a bone implant having a compressive strength of at least about 60 MPa by simply "optimizing" the preparation methods disclosed by Lee et al., as is argued by the Examiner. Thus, Lee et al. provides neither the motivation to modify the Lee et al. method to produce the presently claimed bone implant having a compressive strength of at least about 60 MPa, nor any methodology that could be "optimized" to produce the bone implant of present claims 1, 16, 25, 28, 31, and 32. Even if Lee et al. did provide such a teaching, suggestion, or motivation to "optimize" the methods it discloses for producing the cement composition in order to increase the compressive strength of the cement composition, which it does not, Lee et al. would still fail to provide the bone implant of present claims 1, 16, 25, 28, 31, and 32 because the Lee et al. method includes hydrating the calcium phosphate precursor with an aqueous-based liquid, such as water, to form a paste or putty prior to implantation (see, e.g., col. 4, lines 19-46); a process that would result in a cement composition that would have already converted to a poorly crystalline hydroxyapatite prior to *in vivo* implantation. For these reasons as well, the bone implant of present claims 1, 16, 25, 28, 31, and 32 is not simply an optimization of the cement composition of Lee et al. and the Patent Office has failed to establish a *prima facie* case of obviousness.

Lee et al. Does Not Provide Any Reasonable Expectation of Success

To establish a *prima facie* case of obviousness under 35 U.S.C. § 103, the prior art must

not only suggest the claimed combination, but must also provide a reasonable expectation of success; these elements cannot be found solely in Applicants' disclosure (see, e.g., *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991) and *In re Dow Chem. Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988)). The Examiner argues:

> Applicant's [sic] arguments do not overcome the rejections applied to the claims, since Applicants have not provided any convincing showing that the compressive strengths are nothing more than optimum or workable values as asserted by the examiner...A bone implant must have the compressive strength of the bone in which it is being placed so that it can function properly for the intended purpose. Thus a bone implant should have a compressive strength greater than or equal to that of the bone in which it is being placed. (Office Action, p. 6.)

As is discussed above, Lee et al. does not teach or suggest the preparation of a bone implant having a compressive strength of at least about 60 MPa and comprising an unhydrated calcium phosphate precursor, and one skilled in the art could not simply optimize the Lee et al. method to produce the bone implant of present claims 1, 16, 25, 28, 31, and 32. Furthermore, the Examiner has not established a clear motivation provided solely by Lee et al. that would guide the skilled artisan to modify the reference teaching to yield the invention of present claims 1, 16, 25, 28, 31, and 32, and claims dependent therefrom, prior to the disclosure of Applicants' present invention, nor any expectation of success other than that derived from the teachings of Applicants' disclosure. Therefore, both the motivation to modify the cited reference and the reasonable expectation of success must be derived solely from the teachings of Applicants' disclosure.

Use of Applicants' disclosure to provide a motivation for modifying the cited reference and to derive a reasonable expectation of success is an improper use of hindsight and cannot form the basis for an obviousness rejection. The Federal Circuit has repeatedly cautioned against

the "insidious effects of hindsight" in making obviousness determinations. *Life Technologies, Inc. v. Clontech Labs, Inc.*, 224 F.3d 1320, 1326 (Fed. Cir. 2000). More specifically, the court has stated:

> it is impermissible to first ascertain factually what [Applicants] did and then view the prior art in such a manner as to select from the random facts of art only those which may be modified and then utilized to reconstruct appellants invention from such prior art. (*Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 227 U.S.P.Q. 543 (Fed. Cir. 1985).)

To avoid the use of hindsight, the M.P.E.P. has adopted the same view, stating that "the mere fact that references can be combined or modified is not sufficient to establish *prima facie* obviousness," and that the art must provide "an objective reason to combine the teachings." M.P.E.P. § 2143.01, *supra*. Further, a generally high level of skill in the art cannot be relied upon to provide such a reason. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308 (Fed. Cir. 1999). Thus, absent a specific motivation to modify the reference, a *prima facie* case of obviousness cannot be made.

Furthermore, the Federal Circuit has repeatedly emphasized that "obvious to try" is not to be equated with obviousness under section 103(a). *See Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720, 725, 16 USPQ2d 1923, 1928 (Fed. Cir. 1990); *In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988); *Dow*, 837 F.2d at 473, 5 USPQ2d at 1532; *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1380 231 USPQ 81, 90-91 (Fed. Cir. 1986); *Jones v. Hardy*, 727 F.2d 1524, 1530, 220 USPQ 1021, 1026 (Fed. Cir. 1984).

> An "obvious to try" situation exists when a general disclosure may pique the scientist's curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result, or that the claimed result would be obtained if certain directions were pursued.

In re Eli Lilly & Co., 902 F.2d 943, 945, 14 USPQ2d 1741, 1743 (Fed. Cir. 1990) (emphases added). Thus, where the prior art gives only general guidance as to the particular form of the claimed invention, or how to achieve it, a *prima facie* case of obviousness has not been established. *Dow*, 837 F.2d at 473, 5 USPQ2d at 1532.

Lee et al. simply does not teach, suggest, or motivate the skilled artisan to prepare the bone implant of present claims 1, 16, 25, 28, 31, and 32, and claims dependent therefrom, nor does Lee et al. provide any expectation of success that a bone implant having a compressive strength of at least about 60 MPa could be prepared using the Lee et al. method. The Examiner's argument that "[a] bone implant must have the compressive strength of the bone in which it is being placed so that it can function properly for the intended purpose" is misguided (Office Action, p. 6). Lee et al. clearly discloses a cement composition that "contains poorly crystalline apatitic calcium phosphate solids with Ca/P ratios comparable to naturally occurring bone minerals and having stiffness and fracture toughness similar to natural bone" (col. 4, lines 8-12) and has a compressive strength of about 7-9 MPa (Example 13). Lee et al. does not state that the cement composition has a compressive strength similar to naturally occurring bone, and certainly not a compressive strength of at least about 60 MPa, as is recited in present claims 1, 16, 25, 28, 31, and 32.

The Examiner also argues:

> the conversion of precursors to hydroxyapatite is a time-dependent process wherein the time depends on the choice of precursors. It is well known that the time for hydroxyapatite to attain a certain "compressive strength" or to harden is a function of the precursors used...Thus, it would have been obvious to one of ordinary skill in the art to have selected precursors, as disclosed by Lee et al., so

> that the hardening time or time to achieve a certain compressive strength is between two to six weeks. (Office Action, p. 7.)

This is incorrect.

Conversion of the bone implant of present claims 1, 16, 25, 28, 31, and 32 to poorly crystalline hydroxyapatite occurs over weeks to months rather than in minutes to hours, as is disclosed by Lee et al., due to the time that is required for the bone implant to become fully hydrated following implantation. This extended time for hydration is simply a result of the reduced access of the aqueous liquid to the precursor particles due to the higher density of the bone implant. The specification states:

> The [bone implant] is implanted in the body or immersed in an aqueous fluid to hydrate the powder by wetting the powder particle surfaces, and hydration at suitable temperatures, e.g., body temperature, initiates the reaction of the precursor to form poorly-crystalline hydroxyapatite. FIG. 1B is a schematic representation of a cross-sectional view of the cylinder 100, showing that hydration and reaction of the calcium phosphate precursor 102 to form poorly-crystalline hydroxyapatite 104 proceeds slowly inward from the surface 106 of the cylinder 100 over the course of a one-month time period. (See page 12, lines 12-18.)

Furthermore, it is the high density and efficient particle packing of the calcium phosphate precursor that forms the presently claimed bone implant, which results from the high-energy ball milling process, termed densification, rather than the time required for conversion of the calcium phosphate precursor to poorly crystalline hydroxyapatite, that contributes to the high strength of the bone implant (see, e.g., page 8, line 21, through page 9, line 2). Therefore, one skilled in the art could not simply alter the compressive strength of the Lee et al. cement composition by modifying the hardening time, such as by decreasing the reaction temperature, or by choosing a different calcium phosphate precursor, as is suggested by the Examiner (Office Action, p. 7).

In addition, the skilled artisan would not look to Constantz et al. (U.S. Patent No. 5,336,264) for guidance on how to obtain a high compressive strength bone implant based on hardening time and the precursor used, as is suggested by the Examiner (Office Action, page 7), because Constantz et al. discloses a hardening time of between 2 minutes and not more than 30 minutes (see, e.g., col. 7, lines 55-63), and provides no guidance for extending hardening time or for obtaining a high compressive strength bone implant. In fact, even though Constantz states that a cement composition having a high compressive strength (e.g., 35 MPa, 75 MPa, and 110 MPa) can be prepared using the Constantz method, the Constantz cement composition, when tested, yields a compressive strength of only 7.5 MPa to 32.1 MPa (see, e.g., col. 10, lines 25-40). Therefore, for all of the reasons provided above, Lee et al. simply does not provide a reasonable expectation of success for making or using a bone implant having a compressive strength of at least about 60 MPa and comprising an unhydrated calcium phosphate precursor capable of converting *in vivo* to a poorly crystalline hydroxyapatite. Applicants submit that the Examiner has relied upon improper hindsight to form the basis for the rejection of claims 1-13 and 16-36 for obviousness and, for this reason as well, Applicants respectfully request that the rejection of claims 1-13 and 16-36 under 35 U.S.C. § 103(a) over Lee et al. should be withdrawn.

Lee et al. Teaches Away from the Claimed Invention

The M.P.E.P. § 2144.05(III) states that "[a] prima facie case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997)." (Emphasis added.) A reference teaches away when a skilled artisan, upon reading the reference,

would be led on a divergent path from the one taken by the Applicants.

The method for preparing the Lee et al. cement composition includes hydration of the calcium phosphate precursor (see, e.g, col. 4, lines 19-46). In contrast, the bone implant of present claims 1, 16, 25, 28, 31, and 32 has a compressive strength of at least about 60 MPa and comprises an unhydrated calcium phosphate precursor that converts *in vivo* to a hardened poorly crystalline hydroxyapatite. Therefore, Lee et al. would actually lead the skilled artisan on a divergent path from the one taken by the Applicants. Because Lee et al. clearly teaches away from Applicants' claimed invention, it cannot be used to render claims 1-13 and 16-36 obvious. In light of the above remarks, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness and Applicants request that the rejection of claims 1-13 and 16-36 under 35 U.S.C. § 103(a) for obviousness be withdrawn.

Rejection of Claims 1-32 for Obviousness-Type Double Patenting

Claims 1-13, 16-25, 27-28, and 30-36 are rejected for obviousness-type double patenting over claims 14, 15, 16, 20, 22, and 24 of U.S. Patent No. 6,287,341 ("the '341 patent") in view of U.S. Patent No. 6,201,039 (hereinafter "the '039 patent"). The Examiner states that claims 14, 15, 16, 20, 22, and 24 of the '341 patent variously disclose all of the limitations of pending claims 1-13, 16-25, 27-28, and 30-36 except for compressive strength and that "Brown et al. teach adjusting the liquid to precursor ratio to obtain a hydroxyapatite with a compressive strength of up to 175 MPa" (Office Action, p. 4; citations omitted). Furthermore:

> it would have been obvious to one of ordinary skill in the art at the time the invention was made to have adjusted the liquid to precursor ratio in claim 1 of '341, as taught by Brown et al., to adjust the compressive strength to 60 MPa or

> 120 MPa, depending on the type of bone in which the implant is to be placed. (Office Action, p. 5.)

Applicants respectfully traverse this rejection.

The doctrine of double patenting acts to prevent prolongation of the patent term by prohibiting issuance of claims in a second patent not patentably distinct from claims in a first patent unless the second patent expires before or at the same time as the first patent. This doctrine will not be violated by issuance of claims 1-13 and 16-36, as presently amended, as is discussed in detail below.

The Requirements for Obviousness-type Double Patenting

The M.P.E.P. § 804(II)(B)(1) states that "the first question to be asked is - does any claim in the application define an invention that is merely an obvious variation of an invention claimed in a patent? If the answer is yes, then an 'obviousness-type' nonstatutory double patenting rejection may be appropriate." The M.P.E.P. § 804(II)(B)(1) also states that:

> A double patenting rejection of the obviousness-type is "analogous to [a failure to meet] the non-obviousness requirement of 35 U.S.C. 103" except that the patent principally underlying the double patenting rejection is not considered prior art. *In re Braithwaite*, 379 F.2d 594, 154 USPQ 29 (CCPA 1967). Therefore, any analysis employed in an obviousness-type double patenting rejection parallels the guidelines for analysis of a 35 U.S.C. 103 obviousness determination. *In re Braat*, 937 F.2d 589, 19 USPQ2d 1289 (Fed. Cir. 1991); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985).

The question of obviousness, in cases of double patenting, is addressed using the criteria established under 35 U.S.C. § 103. A finding of obviousness under 35 U.S.C. § 103 is only affirmed if all of the claim limitations are taught or suggested in the cited patent or patents on which the rejection is based (*In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). The

patent specification cannot be used as prior art and obviousness must be determined based solely on the claims of the '341 patent (see *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970)). Furthermore, in *Vogel*, the Court of Customs and Patent Appeals, the predecessor to the Federal Circuit, held that if the rejected claim defines more than an obvious variation, it is patentably distinct (*Id* at 442). In *Vogel*, the C.C.P.A. described an "obvious variation" as an aspect of the claimed subject matter that can be modified based on knowledge in the prior art (i.e., the permeability range of the packaging material; *Id* at 442).

Finally, obviousness can only be established by modifying the teachings of the prior art (here the claims of the '341 patent) where there is some teaching, suggestion, or motivation to do so found *in the reference* (see, e.g., *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)).

Applicants Claimed Invention

As is discussed above, Applicants' pending claims 1-13 and 16-36 are directed to a bone implant and methods of its use for implantation and spinal fusion, in which the bone implant has a compressive strength of at least about 60 MPa and comprises an unhydrated calcium phosphate precursor. In contrast, claim 13 of the '341 patent, from which claims 14, 15, 16, 20, 22, and 24 depend, is directed to an implant material comprising (a) an amorphous calcium phosphate, (b) a second calcium phosphate having a Ca/P ratio of less than or equal to 1.67, and (c) a physiological liquid in an amount to provide a paste or putty. As was discussed in the previous reply, claim 13 of the '341 patent is directed to a paste or putty, i.e., a hydrated precursor, which is generally understood to be a soft, malleable material that would not provide a compressive

strength of at least about 60 MPa, as is recited in Applicants' claims 1-13 and 16-36. Furthermore, the specification of the '341 patent, which may only be reviewed for its disclosure of the invention recited in the relevant claims of the '341 patent (i.e., claims 13, 14, 15, 16, 20, 22, and 24; see *In re Vogel*, *supra*), states that the compressive strength of the implant material, after conversion of the calcium phosphate precursor to a poorly crystalline hydroxyapatite, is 7-9 MPa (see, e.g., col. 22, line 65, through col. 23, line 10). Therefore, the first question, whether present claims 1, 16, 25, 28, 31, and 32 recite the same composition as that recited in claim 13 of the '341 patent, from which claims 14, 15, 16, 20, and 22 depend, is no. The bone implant of claims 1, 16, 25, 28, 31, and 32 comprises an unhydrated calcium phosphate precursor and has a compressive strength of 60 MPa prior to the conversion of the precursor to a poorly crystalline hydroxyapatite upon hydration. The compressive strength of the presently claimed bone implant is far greater than the 7-9 MPa compressive strength of the implant material of claim 13 of the '341 patent. Therefore, the bone implant recited in claims 1, 16, 25, 28, 31, and 32, and claims dependent therefrom, is distinct over the implant material recited in claim 13, and claims dependent therefrom, of the '341 patent.

The next question, whether present claims 1, 16, 25, 28, 31, and 32 define a composition that is merely an obvious variation of the implant material recited in claim 13 of the '341 patent, is also most definitely no. The bone implant recited in present claims 1, 16, 25, 28, 31, and 32, which is provided as an unhydrated precursor, can certainly not be considered an obvious variant when the claims of the '341 patent do not teach or suggest that the implant material can be provided in any state other than as a hydrated precursor. Furthermore, as is discussed above, the specification of the '341 patent states that the implant material of claim 13 of the '341 patent,

exhibits a compressive strength of 7-9 MPa. To remedy the deficiency of claim 13 of the '341 patent, the Examiner cites the '039 patent, which discloses polymineralic particles and a method for their production. The '039 patent discloses that the polymineralic particles, when hydrated with a physiologically acceptable liquid, such as water, at a liquid to precursor particle ratio of approximately 0.25, form hydroxyapatite having a compressive strength of up to 175 MPa (see, e.g., the abstract of the '039 patent and col. 12, lines 20-27). Contrary to the Examiner's assertion, the '039 patent does not remedy the deficiency of claim 13 of the '341 patent because, like the implant material recited in claim 13 of the '341 patent, the polymineralic particles of the '039 patent must also be hydrated to obtain an hydroxyapatite product having a compressive strength of 175 MPa. The '039 patent does not teach or suggest that the polymineralic particles, in the absence of hydration, have a compressive strength of at least about 60 MPa, nor would one skilled in the art, based on the disclosure of the '039 patent, understand this to be so. Therefore, claims 1, 16, 25, 28, 31, and 32, directed to a bone implant comprising an unhydrated calcium phosphate precursor and having a compressive strength of at least about 60 MPa, do not read on, and do not define merely an obvious variation of, the implant material of claim 13, and claims 14, 15, 16, 20, 22, and 24 dependent therefrom, of the '341 patent, either alone or in combination with the disclosure of the '039 patent.

Based on the above comments, Applicants submit that the bone implant and methods of its use, recited in claims 1-13, 16-25, 27-28, and 30-36, are clearly distinct from, and non-obvious in view of, the implant material recited in the claims of the '341 patent, either alone or in combination with the '039 patent. Furthermore, the Examiner has not met the burden of showing that the implant material recited in the claims of the '341 patent constitutes an obvious variation

of the presently claimed bone implant. One skilled in the art would not be directed, based solely on the claims of the '341 patent alone, or in combination with the '039 patent, to prepare the presently claimed bone implant, nor would one skilled in the art be able to prepare such an implant having a compressive strength of at least about 60 MPa, due to the lack of any teaching or suggestion to do so (see *In re Kotzab*, *supra*). For all of the reasons provided above, Applicants respectfully request that the rejection of claims 1-13, 16-25, 27-28, and 30-36 for obviousness type double patenting over claims 14, 15, 16, 20, 22, and 24 of the '341 patent in combination with the '039 patent be withdrawn.

CONCLUSION

In view of the above remarks, Applicants respectfully submit that the claims are in condition for allowance, and such action is respectfully requested.

Enclosed is a petition to extend the period for replying for three months, to and including July 5, 2004, and a check for the fee required under 37 C.F.R. § 1.17(a).

Also enclosed is a check for $54.00 for the addition of six dependent claims. No other fees are believed to be due in connection with this correspondence.

If there are any additional charges or any credits, please apply them to Deposit Account No. 03-2095.

Respectfully submitted,

Date: June 28, 2004

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